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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/981,277	10/17/2001	Janice Nickel	10991744-4	8131

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EXAMINER	
PIERRE, KENELT	
ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 07/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/981,277	NICKEL, JANICE
	Examiner	Art Unit
	KEN PIERRE	2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12 to 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12 to 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. This is in response to the Applicant's arguments received on June 13, 2002 in which no amendment was made to the claims.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 12, 15 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Gallagher et al. (5640343).

Regarding claims 12, 15 and 16, Gallagher et al disclose (ABSTRACT) (FIG1a) a nonvolatile magnetic random access memory (MRAM) is an array of individual magnetic memory cells. (Col.2, line 60 to 67) Each memory cell is a magnetic tunnel junction (MTJ) or (SDT). Each MTJ is formed of a pinned ferromagnetic, a free ferromagnetic layer, and an insulating tunnel barrier between and in contact with the two ferromagnetic layers. (Col.2, line 42 to 50) The resistance of MTJ 8 can be adjusted to the value desired for the operation of the memory circuitry without adjusting its surface area. (Col. 3, line 45 to 65) Sets of electrically conductive traces function as parallel word lines and parallel bit lines. (Col. 4, line 16 to 25) The MTJ 8 is formed of an initial ferromagnetic, an antiferromagnetic layer (AF), a fixed ferromagnefic layer a thin tunneling barrier layer. (Col. 5, line 8 to 11) The two ferromagnetic films is separated by

a thin metallic layer, which results in antiferromagnetic (AF) coupling of the two ferromagnetic films. (Col.6, line 20 to 45) The surface smoothness (Flat peak) of the lower layers is very important to control the MTJ or the SDT resistance.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 13, 14 and 17 to 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher et al. (5640343) in view of Inomata et al (6069820).

Regarding claims 13, 14 and 17 to 20, Gallagher et a disclose (ABSTRACT) FIG1a) a nonvolatile magnetic random access memory (MRAM) is an array of individualmagnetic memory cells. (Col.2, line 60 to 67) Each memory cell is a magnetic tunnel junction (MTJ) or (SDT). Each MTJ is formed of a pinned ferromagnetic, a free ferromagnetic layer, and an insulating tunnel barrier between and in contact with the two ferromagnetic layers. (Col.2, line 42 to 50) The resistance of MTJ 8 can be adjusted to the value desired for the operation of the memory circuitry without adjusting its surface area. (Col. 3, line 45 to 65) Sets of electrically conductive traces function as parallel

word lines and parallel bit lines. (Col. 4, line 16 to 25) The MTJ 8 is formed of an initial ferromagnetic, an antiferromagnetic layer (AF), a fixed ferromagnefic layer a thin tunneling barrier layer. (Col. 5, line 8 to 11) The two ferromagnetic films is separated by a thin metallic layer, which results in antiferromagnetic (AF) coupling of the two ferromagnetic films. (Col. 5, line 20 to 45) The surface smoothness (Flat peak) of the lower layers is very important to control the MTJ or the SDT resistance. (Fig. 4) Where the range of change in the SDT resistance is from zero to 6%.

However, Gallagher et al is silent about the grain orientation in the interfacial layer and the valley-to-peak height of the SDT or MTJ bottom layer.

Inomata et al disclose a (MTJ) or (SDT) Device where (Col. 19, line 50 to 57) the grains 15 may preferably be arranged to be one or two layers so as to form a uniform tunnel barrier. (Col. 19, line 60 to 67) where the grain size may preferably be 1 nm or more so as not to have super-paramagnetism.

Therefore, it would have been obvious to one of ordinary skill in the art at the Time of the invention was made to modify the invention of Gallagher et al by arranging the grain in the interfacial layer to a desired angle to have a uniform tunnel barrier, and to use grain size as small as 1 nm in order to have a valley-to-peak variation no more that 1 nm, and to not have super-paramagnetism as taught per Inomata et al reference.

R sponse to Arguments

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

After a complete reviews of the response the claims and the references, Applicant's arguments are not persuasive. Claims 12 to 20 are not in condition for allowance.

With respect to claim 12, applicant argues, that Gallagher et al do not teach, "Surface smoothness (Flat peak) is very important to control resistance" and "a pinpoint cite of such teaching is not provided ". The Examiner would like to read the location of such teaching once more: The resistance of the MTJ 8 is strongly dependent on the thickness of the tunneling barrier layer 22, its electronic barrier height, and the layer material properties, such as the surface smoothness of the lower layers (Col.6, line 24 to 45). Therefore, the Examiner considers said surface smoothness to the parameter that indicates the nature of the surface. Mentioning "Surface smoothness" equivalent to mentioning "Surface roughness" which implies the presence or the absence of peaks on the surface. "Flattened peaks" means smooth surface, and "non-flattened peaks" mean rough surface.

With respect to claim 17, Applicant argues, that neither Gallagher et al nor Inomata et al teach "Valley to peak variation". Applicant argues, " Grain size refers to the diameter of grains, not their height". The Examiner begs to differ by invoking a "Basic geometry laws " If the grain size refers to the diameter of the grain, this implies that the grain is a circle. The diameter of a circle is also the height and the width of the circle since a circle is by definition a closed line smooth with no sharp angle. Therefore, a layer formed by these grains will have at its interface valley to peak variation equal to the grain size unless the grain interface surface is rendered smoother by polishing.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Ken Pierre whose telephone number is (703) 305-4002. The examiner can normally be reach on Monday-Friday from 8:30AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Carl Whitehead, Jr. can be reach at (703) 308-4940. The fax telephone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or processing should be directed to the receptionist whose telephone number is (703) 308-0956.

KP

July 8, 2002

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800